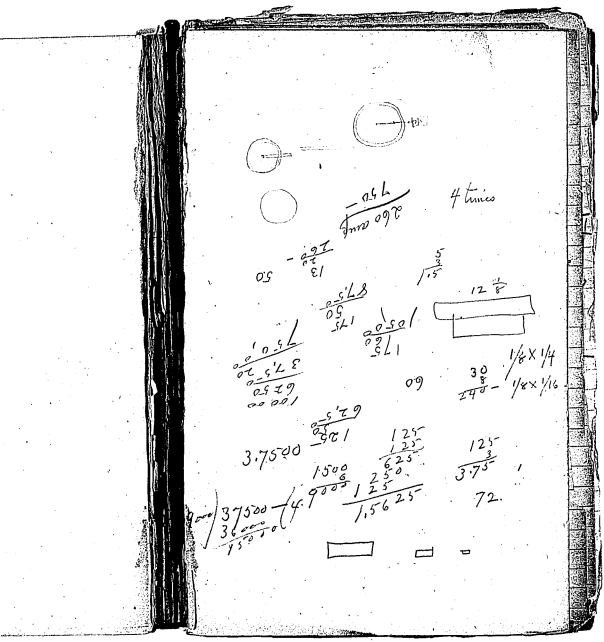
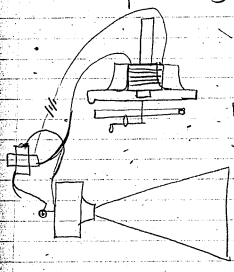
Notebook, N-02-04-18.1

This notebook contains dated entries from March-April and December 1902 and from October 1903. All entries are by Edison. Included are notes and drawings regarding phonograph recording and reproducing apparatus and the composition of phonograph cylinders. Several entries indicate that some material was transcribed from notebooks used at Edison's laboratory at Fort Myers, Florida. Also included are notes and drawings relating to storage batteries and to an alternating current rectifier. The front cover is labeled "Important Disc Expmts." This may indicate that the book was copied, or referred to, at a later date, since the phonograph entries pertain only to cylinder technology. The pages are unnumbered. Approximately 80 pages have been used.



Phonograph Experiments
April 18 1902 -

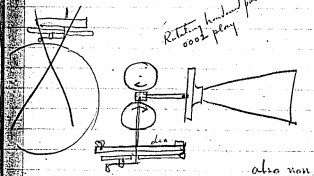


Bell diaphragm on piano - talking to a good Mic[illegible] + large funnel -

also Carbon button in place of magnet

April 18 1902

Extd from Pb book Mch 21 1902



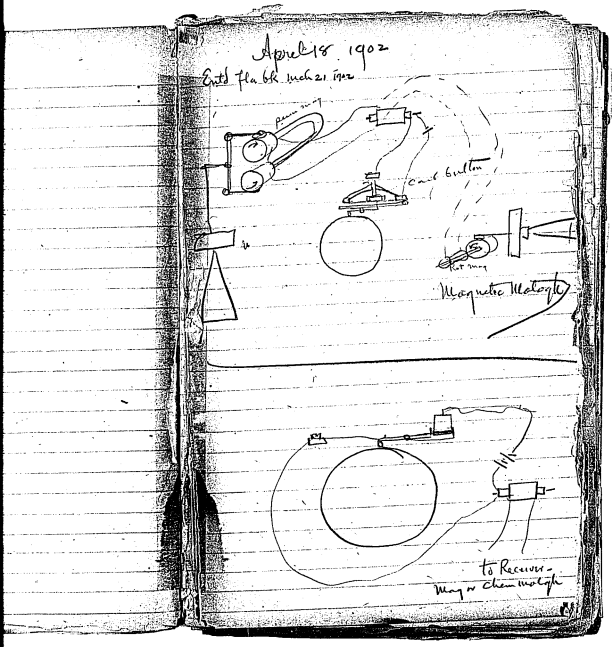
also non slip wheels
+ Rubber friction wheel
Rolled surface (cast) to
minimise Coeff of friction
or roads.

or Carborundum Stone - Mother board, Strips, Lithographic stone + rubber

Very likely with wheels of a compn like Cork or Stone + a
Substitution slightly flowing will get a Mechanical Belt.

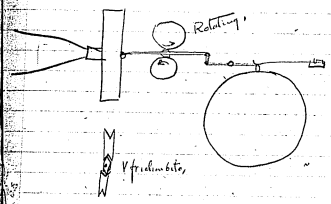
April 18 1902

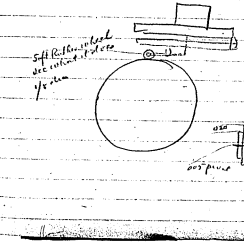
Entd Pat Off March 21 1902



April 18 1902

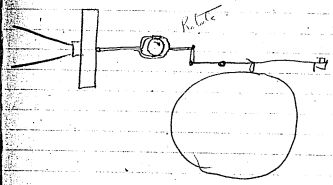
for flatbk—March 21 1902

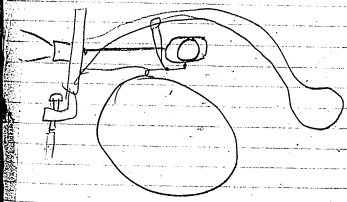




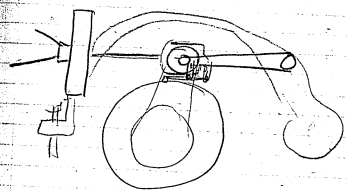
April 18 1902

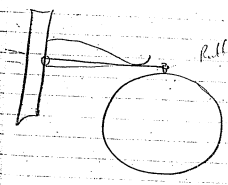
Exhibit March 22 1902





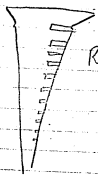
April 18 1902





Plumbago mouth piece
+ try platina button, highpoint
many make diff. central to give
perfect reproduction
Good Telephone [illegible]
Invented Aug 1878

The ancient used brass resonators to
strengthen the voices of actors



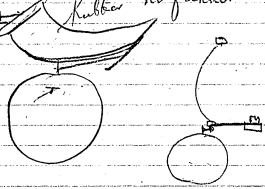
Resonators turned to
overtones or most
fundamental etc.

Try diaphragms which leak
sound drawn to lone down the
fundamentals + emphasize overtones
200 mesh screen, Bolting cloth,
perforated cups of grid of Sarran with
porous cloth over it Waxed filter paper
on 200 mesh screen - etc

Also Req ~~Recorder~~ Recorders with Aluminum
or steel disk with row holes .005"
all around

Felt or powdered Charcoal or other
powders,

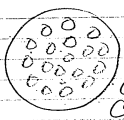
Think of Cavity of neg records
was made larger & powder of a
heavy metal pounded in sound
would go through & dia would
be doubled and
would have to use pressure proof of Saphir



would have to be large a Cabinet built for pur

Line a funnel with felt

Steel fish pole for funnel + probing it.



perforated dia
Coated over with
Collodion —

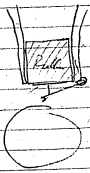
Dip a cylinder in a mush of dimorphous sub like ferrocyl Fe ferrocyanide or cobalt. that dries to a fluffy powder, Mop with ether Alcohol ie gravitom to dry quick — then proceed by using Gold spatula + Reamer like Walter now rubber give to Wurth to plate there will be no reboration to dis — can smug out overtones fine etc a

April 18 1902

Matrix made this way shaved Gear perfect moulded Cylinder

Lampblack, Oxlime etc

Possibly Rubber would act like air



Materials for Cylinders & Mixing with Chrono Cylinder

Lanolin, is an alcohol from sheeps wool, its like Vaseline might do for mixing Merck 50 lbs't

Spermaceti, is Palmitate of Cetyl (16) Palmitic acid + Cetyl alcohol, palmitic acid is a close brother to Stearic acid ordinary Spermaceti has some oil in it. Cold Ethyl alcohol dissolves out the oil,

Beeswax, mostly Composed of Palmitate of Myricyl, Myricyl is an alcohol, powder the Beeswax - Ethyl alcohol dissolves out everything leaving the Myricyl alcohol.

Chinese wax. This is a beautiful white wax - & is very peculiar, its somewhat like spermaceti. It is Cerotate of Ceryl. Cerotic acid is somewhat like stearic acid -

---

Stearate of Ethyl is waxlike and easily fusible,

Dodecatyl is the solid alcohol in Spermaceti & Bottlenose whale oil

Ricinolin is the acid in Castor oil -

Elaïdin is the solid in Olive oil

Chlorostearic Acid—
Made by treating Stearic acid at 212° with Chlorine, (dry) it gets thicker & forms a Resin. This resin forms with Soda or Potash an amorphous Soap. Can form subsalts or Soaps with all the metals,

Stearate of methyl
Semitransparent Crystaline
Mass. Easy made

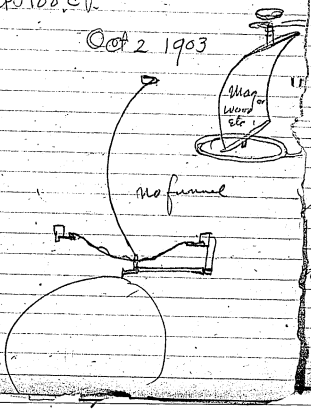
Stearate of Ethyl, Translucent mass, soft at 14° afterwards hard & brittle. Easy made.

Monostearin, hard friable
Waxy mass.

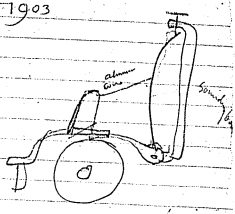
Ethal = (Hydrate of Cetyl) Merck has it

Cetylate of Sodium Solid
MP 100 C.

Oct 2 1903

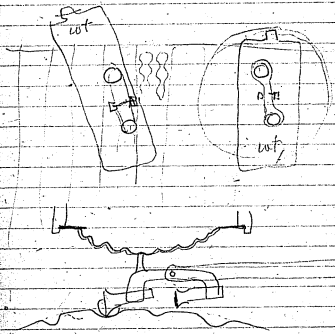


Oct 2nd 1903



Rubber with segments
My Corrugated Cement
so there are 6 segments
unbroken & therefore
but act as a vacuum
they give more amplitude than if the
Vibrator on 2 gives as a whole like ones we
now have

Oct 2. 1903 Chaves –



Double Recorder
Knocks 20/1000 2 natural
one of 40 Mops – Peeped
ornate dance – measure
They give Sam the
acceptance

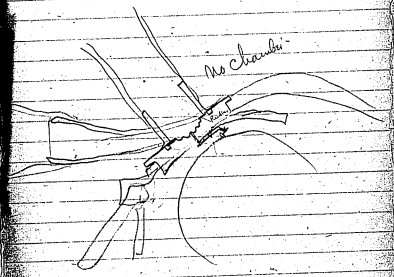
Oct 2 1903 –

With the 1¼ dished Cor dia. The rubber to be pulled as a strip 3/4 wide + 3.75 inches long as the dia revolves as a wheel, then this amount of rubber must be stretched + work done by moving 61/100 diaphm – The total pressure on the diaphm will be the same if funnel angle carried out properly, but now the diaphm will have a longer + amplitude because the amount of rubber to be stressed is half + therefore double the amplitude will only require the work on the smaller area of rubber at 2.4 pm of the same as on 1.25 dia with ¾ in the amplitude, thus not resort to doubling the amplitude or quadrupling the Volumne or Strength of sound – + in addition the mass of the disc to be moved is about 4 times less hence inertia will tend to distort the true sound waves very much less –

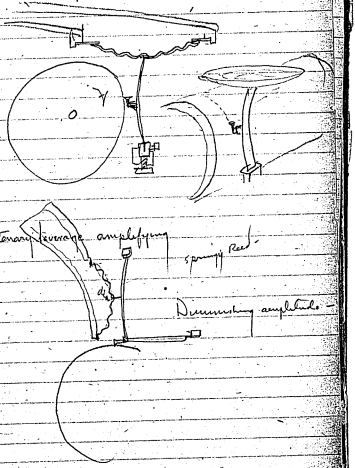
The area of Rubber ¼ in equivalent to bending a band ¼ inch wide ⅛ deep wherein the 61/100 diaphm only has to bend a piece ⅛ by ⅛ on with the work for same amplitude the total thickness is ¼ in the annulus dia to make it follow the

Oct 2d 1903 Thurs

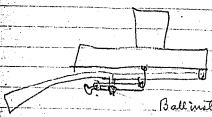
sound waves which owned to a defect were it not for the fact that the weight to be moved is only one quarter. therefore dont need the elasticity or spring action — Thus we keep approaching the human Ear Especially if we have negative leverage of the vibrating knife on the bone. This idea is applicable to reproducers but not with Equal advantages



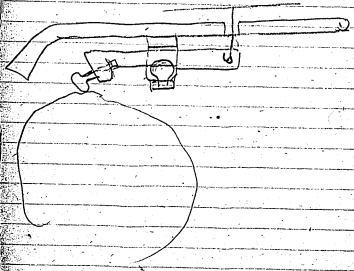
Oct 3rd 1903 —



Oct 3rd 1903—



Ball inside of shaft to lever by universal joint back on side—



Oct 3rd 1903 –

Thinned Rubber sheet we have been able to get is .006 – Make some Thinner by flooding with film dope device, Rubber dissolved Benzol one greased glass other Xylen dry film brown with Chloride Sulphur. Can probably get it .001 thick Can use Bump rings but cant from this for the Recorders with 3/4 inch diameter and less. The .001 bound do for the 3/8 dia diaphragm Corrugated & dished –

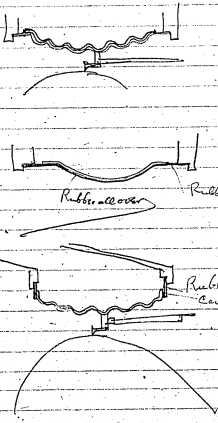
Make some blanks for recording by using dry cutting dyes etc that are Easy to Cut but not brittle over Dobbs on account of Crystalization –
Pour in patented Copper Mould them Say 1/32 inch, con 15/1000 – pour just above Melting point sandemic Chill by Water with Salt etc as fur below freezing point as possible

Oct 3rd 1903

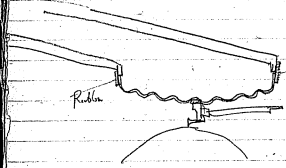
Use Stearic acid alone & with palmetic
" Chinease Wax " " other thing
Spermaceti " "
Highest MP Paraffine — "
Ozocerite purified Crude — "
Japan Wax "
Benzoic acid "
Salycilic " & about of other "
Tolluene Crystalene Methylate Organe
Like Naphthalene Alpha Naphthal, Beta
Anthracene Picric — Naphthylamine - Etc
Then shelling will probably make
most of them amorphous & powder
they will not change to crystalline
form before can get ah Electrolyte
Matter from them —
To get the best results the Mould
should be heated to same point
as Ingot so the shell chills
by heat to the Cold Ingot —
Possibly a thinner blank above
Pressed & false shell so as to
prevent strains & Cracking

See further on in book for
other substances

Oct 4 1903 - John Ott making
the chill mould for the chilling
Records - #15.-

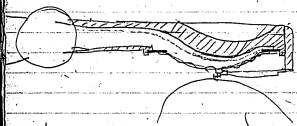


Oct 4 1903 – Thurs –

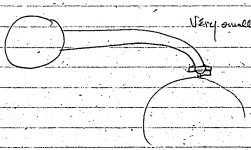


For hard material for Records. Try a mixture of Asphalt, say Syrian with a little Solid Kott to correct acid itg & add Carnauba – This material is very hard so it can accurately be cut with Sapphire recorder & of any depth of record – think (amplock can be) Bubbled, possibly purified Trinidad Could be used if grit got out Hard Cubian anyway! Is warmed by Cheap

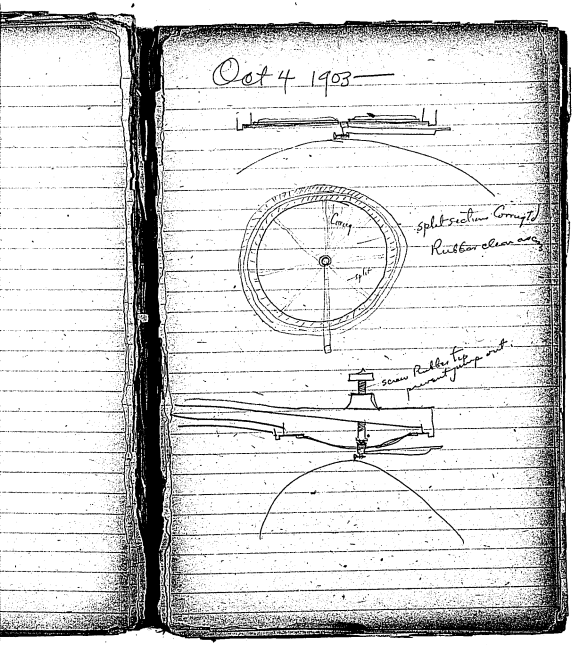
Oct 4 1903 Phonograph



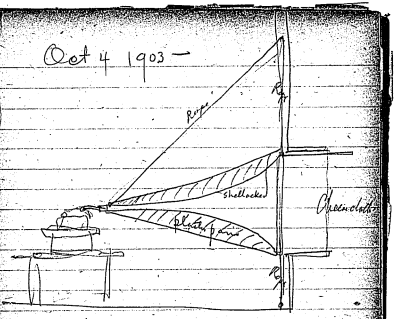
Smaller Chamber for Reg Recorder - can be even smaller as dotted line
This will increase the pressure —



Oct 4 1903—

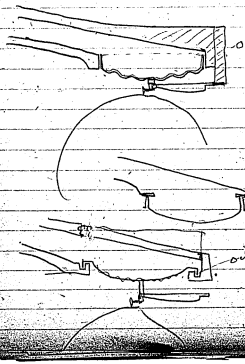

split section Comp'n
Rubber sleeve
Ring
split
screw
Rubber tip
pivoted finger point

Oct 4 1903 —



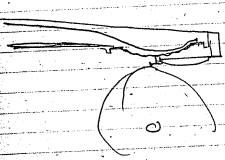
Oct 6 1903

My old Rapider with piston cam & link to work to work by closer filling & a read instead of a lever to give required elasticity – run Ernst with an oil of just appreciable viscosity.

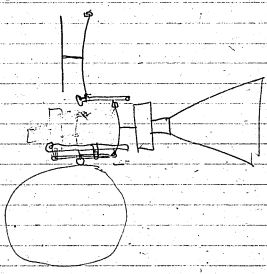


Oct 6 1904

It may be possible that I have over Chamber too large in dished Corrugated Reed Can make thin



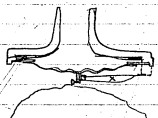
Oct 6 1903
Repeater



Think that with .002 or .003 Rubber around Edges that floating coil in Repeater Can be dispensed with the steadiness of the Rubber taking Care of the secondary of the Record

OVB

Oct 6 1903



X fastened + pulled out say 1/16 — possibly 3/64 only
The records will not run out over 1/16 — make rubber so thin that strain will be no greater than what weight would give hence record not be worn any greater, Rubber was .002 magnesium for lightness + Acid Cured rubber tissue, + X wood bamboo or Aluminum — If piston Regler can be got this with acid would be perfect —

Tried Old made thin Regler today it was good but not so loud as Reg 62 balance There was no leverage Rubber was 5/1000 + only 3/64 first shaved to 3/32 + 003 Rubber Wonderful but want of self tracking

500,000

2½"

Oct 6 1903

See if a thin shell of fusible metal can be cast on a Master by dipping a thin shrunk out,

Also try gutta percha dip & then Beg wax dip & shrunk Compound recent out gutta per tough surface.

Try Experiment of shellac'd moulds of Master Matrix ~~with thin~~ Dry perfectly & dip Beg. Think we can get a hard shellac surface — Coned dope shellac with dampblock clay stock to harden & paint it on or a thin dip & dip right off in Beg Record wax & formaline Beg wax

18 | 133 / 126 / 7 — 18 plate 166 amp per plate

30 | 248 (8.2 — 1 amp per plate

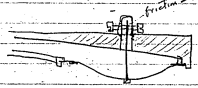
45 | 360 (8

18 | 2988 (166

Oct 6 1903

Possibly film dupe could be used of dry cured dupe & whole freeze together — perhaps could be printed in Bengal mix of Asphalt & Cinnamon & get half tones in purpose in that manner

Try Bismuth for Vac deposit on Records to Shay deposit & I dont think will Oxidize — it can be put on thick



Oct 6 1903

Materials for master records to be tried in new powerful shelling Moulds to turn from highly Crystalline to amorphous

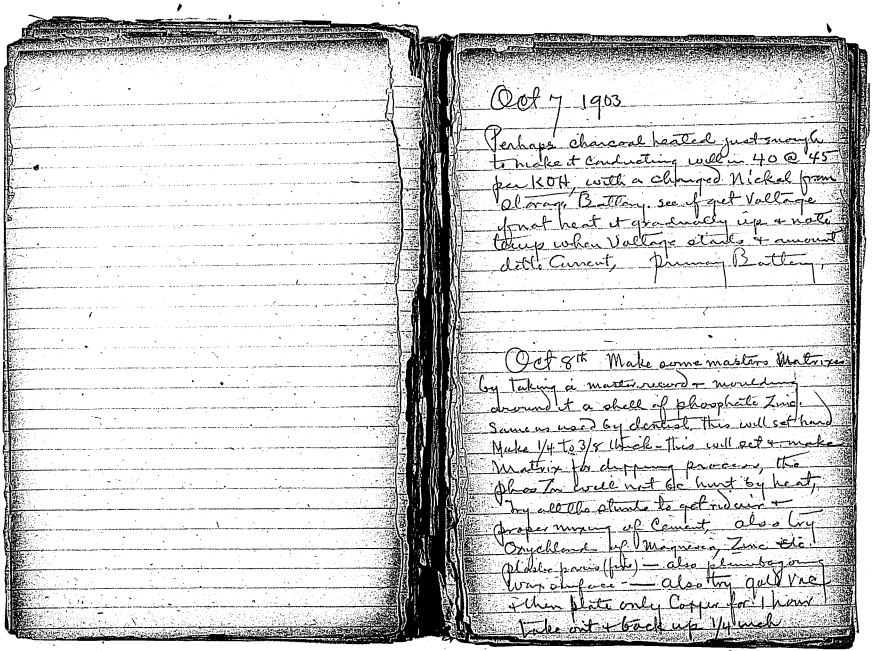
Acetanilide MP 113 C 43 c lbs -
Benzoic acid MP 121 C
~~Stearic~~ Palmitic. Merck 75 c lbs -
Picric MP 122 C 24 c oz -
phthalic acid anhydrous MP 24°
Salicylic acid MP 156 C 76 c lbs
Succinic acid silken 100 lbs -
Antimony hydrochloride MP 190 - 24 c oz
Antimony MP 213 C 24 c oz
Antipyrin 15 c oz MP 113 C ng. trial
~~Bromated~~ para Benzene MP 87 C
Betol MP 95 C 60 c oz
Monobromated Camphor 22 c oz MP 76 C
C [illegible] from Merck Index

Oct 7 1903

I think with new wedge shaped shaded Cow Vib at Edge Recorder that we have now reached a point where we can increase leverage on Recorder Thin or prove that Condemy or neg leverage is the thing

Trace amplitude possibly 3 times the amp

If low amp shows that neg power + neg leverage is a big thing Increase in size of Dia must be increased or Neg leverage increased greatly is impossible



Oct 7 1903

Perhaps charcoal heated just enough to make it conducting will run 40 @ 45 per HOH with a charged Nickel from Storage Battery. see if get Voltage that heat it gradually up + note drop when Voltage stands + amount of Current, running Battery

Oct 8th Make some masters Matrixes by taking a master record + moulding around it a shell of phosphate Zinc. Same as used by dentist. this will set hard Make 1/4 to 3/8 thick - this will set + make Matrix for dupping process, the phos Zinc will not be hurt by heat, try all the plants to get reverse + proper mixing of Cement also try Oxychloride of Magnesia, Zinc etc. Graphite paint (lute) — also plumbago in very fine — — also try gold Vac + then plate only Copper for 1 hour take out + back up 1/4 inch

Oct 6 1903

Phos Zinc — try Portland Cement, then will question the process

After thinking over all the experiments we have tried on non-flexing diaphragms & considering the sound waves as if it were fluctuations in any compound on the Recorder being the cylinder — it is evident that the non-flexing diaphragm is a great advance in the art. That there is a relation or "best point" between the weight of the vibrating piston & parts and the diameter of the piston or diaphragm that probably 1 to 1½ inches is best that the lightest, stiffest possible material should be used & dashed & Corrugated so strongly that if clamped at edges ——— no sound waves would be recorded on phonetic word waves and be except in the EARNEST manner & degree that the Rubber etc should be very thin & perfectly Centered & Concentric & that the capacity of diaphragm to move freely in a horizontal plane as a long thing as apparent accompanying of the fixed rod & does as rod diaphragm

Oct 8 1903

a crude experiment, false reasons that the disc being non flexing can have no fundamental tone of its own or any section in tone with higher notes, + consequently the disc has will be due to the frictional, if the rubber edge of reed + this is to be proven to do/and anything or produce inharmonics. The only trouble remaining being the fundamental note of the funnel. By using the new crude form our funnel + bringing its fundamental up to a very soprano tone in the highest notes of the piano which are as low used the defect will be eliminated.

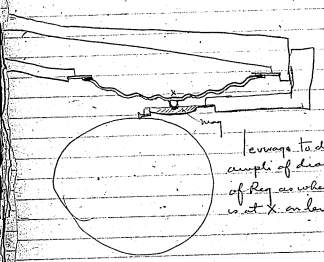
The thing to be done now is to conduct a series of experiments with pierced cards with some tuned + pierced funnels + Reeds phonetic + vary only the leverage of the Reed. Who will determine if its best to get sound Records by having large amplitude to the diaphragm + no leverage or Reduce the amplitude of the disc + get the same record by increasing

Oct 8 1903

the amplitude of the record knife by
leverage of the reed. Its a question
between the power lost in internal friction
of the rubber + the power lost in moving
the levers mass + friction of cutting +
bending of mechanism + loss by internal
friction. Taking all things into consideration
I think it will be found that diminishing
the amplitude of diaphragm + getting
the required movement of the knife
by levers will be better than to have
no leverage + increase amplitude of
diaphragm to get same result, am not
certain of this as constraint on freedom
of vibration of diaphragm sometimes produces
distortion of wave like local echoes in
chamber due to the disc — If there is
a gain in using levers, there ought to be
by introducing for getting point forced
waves by causing bounce of sound
To recede from point + then get
more natural tone without
overforcing loudness —
Start lessons 900 on these Experiments

Oct 8 1903

Better use Magnesium for the lower Knife



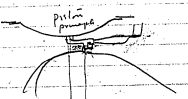
Leverage to diminish amplif of diaphm 1/2 of Reg as when knife is at X on lever -

Possibly this whole idea is wrong + there should be negative leverage giving the greatest possible freedom to Diaphm - so it can follow the boundwave -

Freddy Otto made this today but it shows clearly that the cutting work is the main factor + that negative leverage is

Oct 8 1903

the right thing – His change of leverage was 1/5 less than of in Center of disc



This gave good results, we kept getting Knife towards fulcrum on lever + using thumb rubber + proved that the right thing is Very thin rubber or negative leverage. The Knife being moved nearer to fulcrum of lever so the thumb, or projection to depress, moved – The loudness was not diminished but the quantity was so much so that I think Thin piston non flexing diaphragm with negative leverage will form an Epoch in the art of phonograph Recording – Just how to do it now as he Can make everything accurate –

The Recorder tried was one of the 25 made by Hoffbauer + the reproducer with frictional shaper + Central Hole (Pat) + balancer

Oct 8 1903

Alternating Current Rectifyer

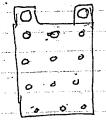
I cant see why a cell containg several hundred thin sheets of iron nickel plated + coated with Ni hydroxide on half plates + Fe oxide on the Cyl. H. like we use — storage batteries + operated at 60 Cy. Cant be used for alternating Current rectifyer it should turn it into a decomplt Current or practically so + 62 a very practical — Commercial matter — many cells Coiled 62 used thereby to voltage. The Ni Fe Alkalin Storage Cell is now reversable — hence, one wave would give say 3.30 Volt + the other wave a very slight reverse voltage.

Work this up. Use nickle black plate .007 dep + plates + weld with, the Ni hydroxide can be got on by cycling in sulfuric acid or other plate for positive or a hydrogen or cath of nickel on both hydrogen — only want but 1/2000 Ni(OH)2 of Fe + Can use 35% KOH Sol + get low Res + good —

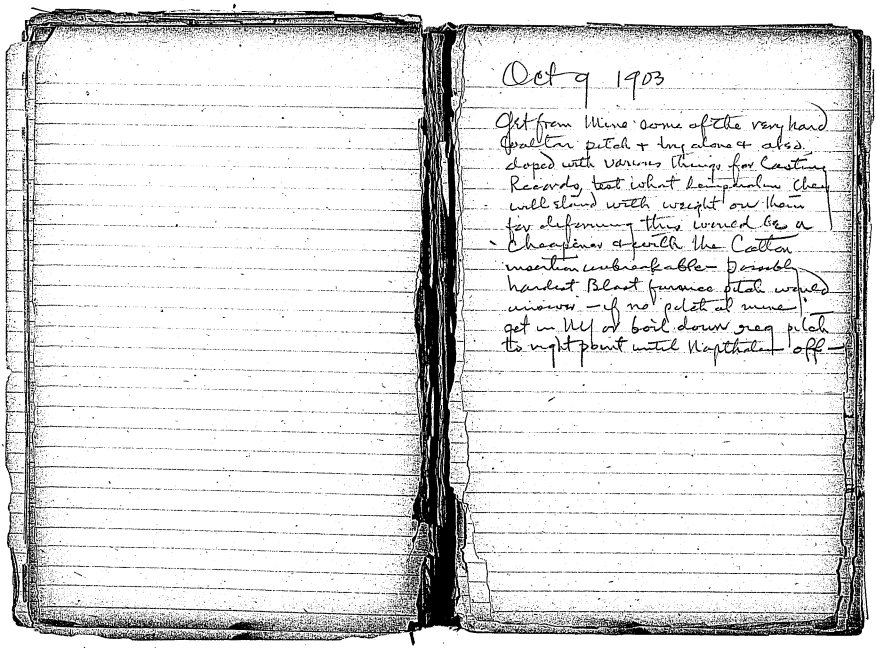
Could use other things than Fe + Ni — for Fe work on good voltage but nickel plate the best

Oct 8 1903.

for stiffening possibly should be corrugated —
for separating could be thin mechanically &
linen

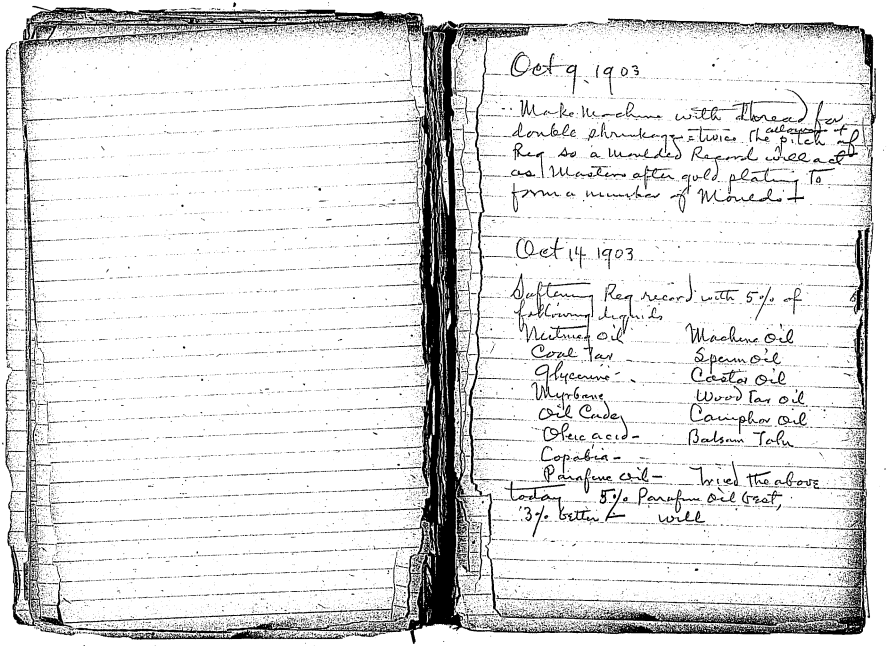


1 or continuous rolls, double, and washed between, — can not use that of separated by paper parchmentized might last but the doubtful in 35% @ 40% —
one defect of roll is it would carry heavy current like plates —
the Number of cells should be as proportioned to Voltage as to just receive small charge so not to make gas on Reversal



Oct 9 1903

Off from Mine some of the very hard Goulter petah + try alone + also doped with various things for Casting Records, test what happens they will stand with weight on them for dispensing this worried be a Chargeman + push the Cotton mountain unbreakable - Dissolve hardest Blast furnace petah would answer - if no petah at mine get in Ny or boil down greg petah to right point until Naphthalene off -



Oct 9. 1903

Make Machine with Thread for double shrinkage - twice the pitch of Reg so a Moulded Record will not ca[use] Masters after gold plating to form a number of Moulds

Oct 14 1903

Softening Reg record with 5% of following liquids

Neatsfoot oil	Machine Oil
Coal Tar	Sperm oil
Glycerine	Castor Oil
Myrbane	Wood Tar oil
Oil Cade	Camphor Oil
Oleic acid	Balsam Tolu
Copaiba	
Parafine oil	Tried the above today 5% Parafin oil best, 3% better Machine oil well

Oct 14 1903

Try following - Rag + 5% Menthol
Camphor Benzaldehyde Chloral + CH
Pyridin Pratts Cretinal Asphaltoil
Boiled Molasses

Also try all of these oils with Rag
wrap with Carbon left out.

Also Pinz Camomba with 5 to 10% of
all the oils etc

Also 1/2 Camomba 1/2 Rag with Carbon
left out + the oily liquids.

Try a stiffer tail on Reed of piston records
Try putting tail of reed below cutter

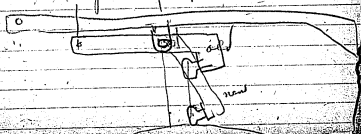
Oct 14th 1903

Instead of securing reed by Tail use a bolt like the Dan & kept against Normal by Elastic and etc Marked by Magnesium Read

Change over a Reg Reader Illus

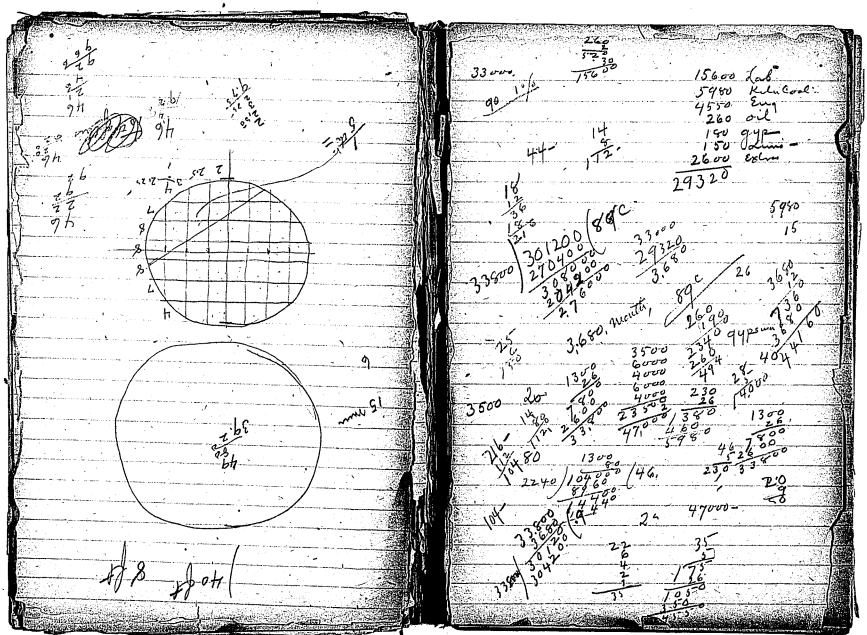
String spring to raise up going up hill on a deep indentation & prevent jumping of ball & formation & an extra indent by ball itself —

Change in Reg Reader Illus



Oct 15 1903.

To prevent repeder ball from running on sides + to get better wear make a Track one thread in advance of Reg. Knife or adjust that so bottom of groove will just use top does now with the groove thus will give perfect tracks

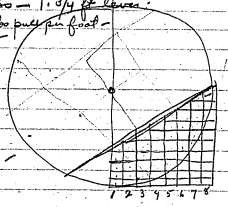


4" Conc.
18 gypsum
12 conc
71-
6
77-

22/400 (18
396
186
900/2000 (2.22
1800
2000

1.75 ft all the load

1000 lbs — 1.3/4 ft lever.
or 500 lbs pull per foot.



1	4.5	40 · 1240	8. Cubic ft
2	5.75		
3	5.5		
4	5.75		7
5	5.75		210
6	5.50		
7	4.75		
8	2.00		

90 HP

210 125/1000 31.5 (90

15000
200
3000000
2970000
30000
0

36

Christmas Eve 1902

Figures to show 36 plate cell with 1/2 thickness of pockets will permit use of 35% KOH + give just as good watt hours. Capacity per lb + twice the discharge rate as present pockets 18 plate 20% KOH

Present.

18 grids 720 grms
9 " 640 " .005 pkts stock for Ni -
9 " 1296 Ni material 6 grms per pkt
9 " 432 pkts .003 for Fe
9 " 1512 7/2 7 grms -

446 | 4600 (10.31 lbs
446.00
1338
620

20% KOH
35/1000 space 3 1/2 wide -
900 mah to V. 195 amp at 122
238 Watt hours 17.5 lbs
13.6 Watt hours per lb
54 lbs per HP

Next page

18 · 24 · 3/1.18
40
7/2
24
7/2
644

36 24
36 6
216 144
108 9
3896 1296
24
520
360
9 3 24 216
1512 2
168 3 1
125
2 129 65 - 17 swell
145 60

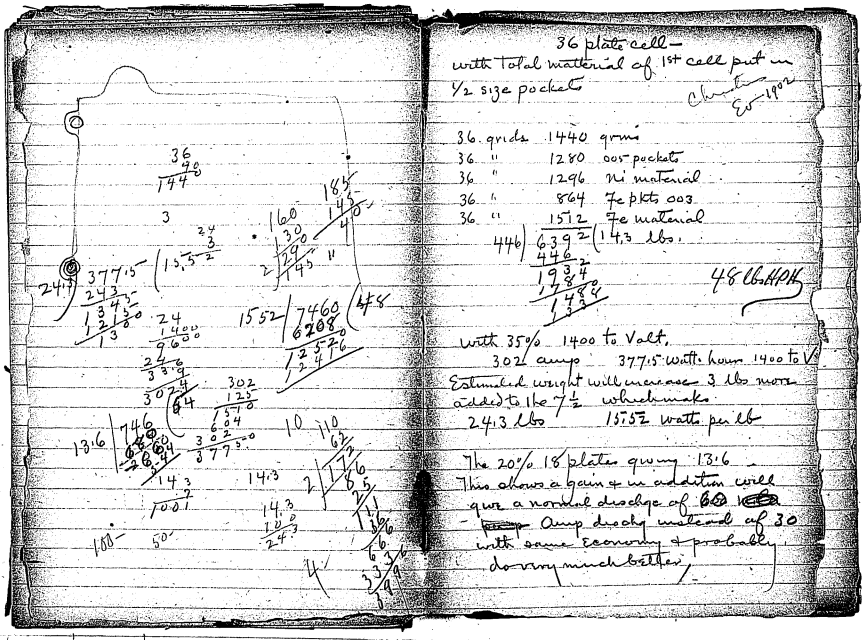
24 24
9 9
216 1944
4 4
1944

195 -
122
390
390
1365 -
237 17
52

82 -
60
2 142 100 - 3.16 -
71
29
9

17.5 | 238 | 13.6
175 0
63 0
35 0
280
280

160 180
18
1440
1800
3.24



36 plate cell—
with Total material of 1st cell put in
1/2 size pockets

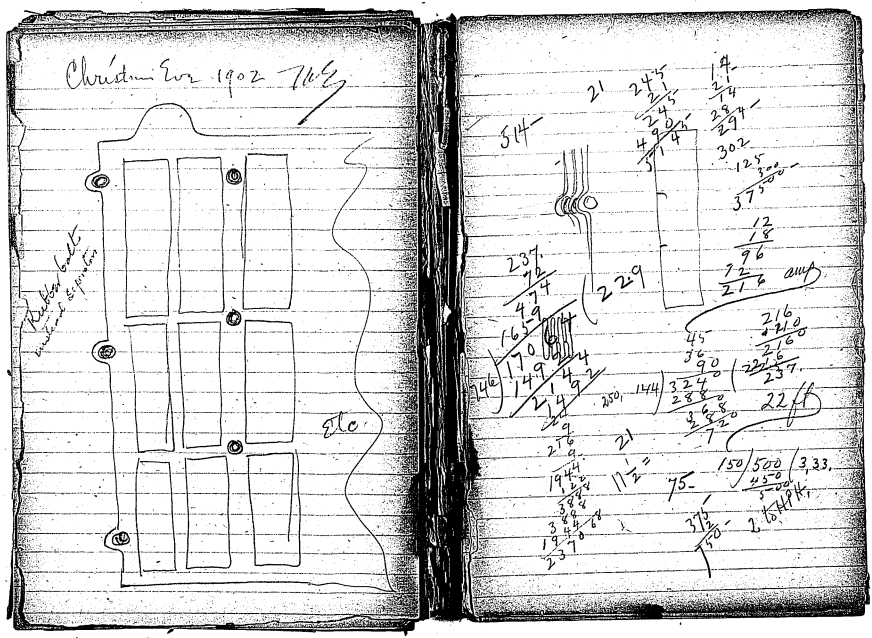
36 grids 1440 grms
36 " 1280 oos pockets
36 " 1296 Ni material
36 " 864 Fe pkts oos
36 " 1512 Fe material

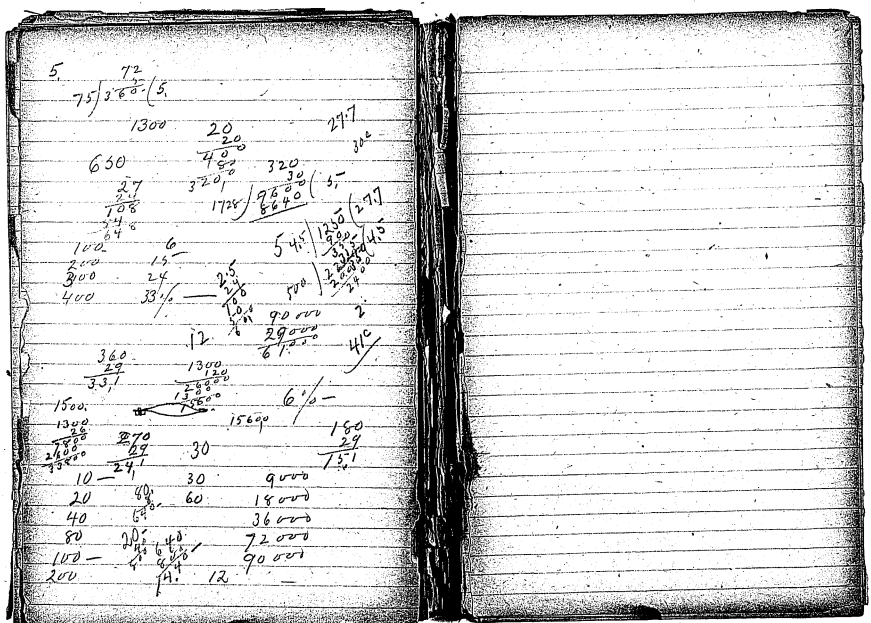
446 | 6392 (14.3 lbs.
446
1938
1784
1540
1338

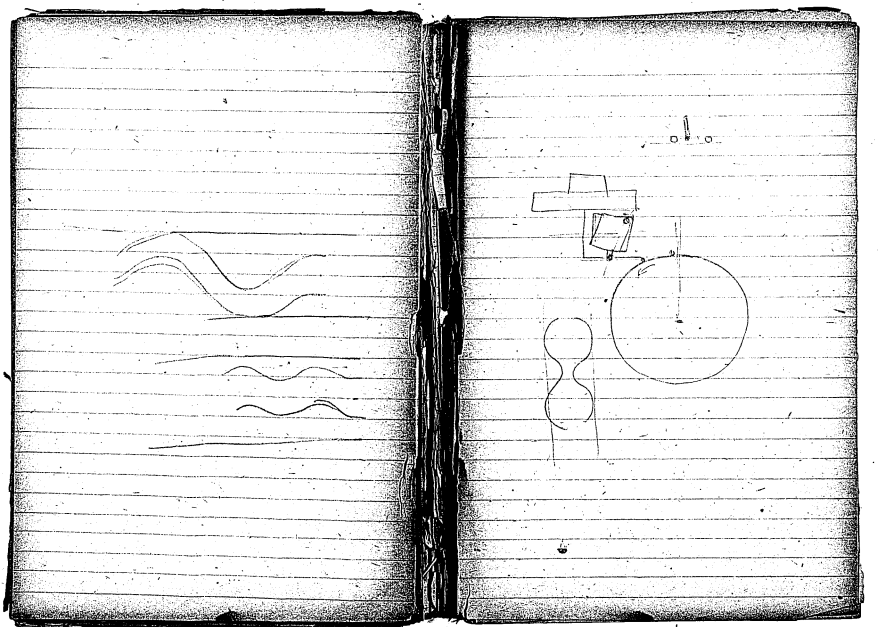
48 Lbs HPK

with 35% 1400 to Volt.
302 amps 377.5 watts hours 1400 to V
Estimated weight will increase 3 lbs more added to the 7½ which makes
24.3 lbs 15.52 watts per lb

The 20% 18 plates giving 13.6
This shows a gain + in addition will give a normal discharge of 60 Amp
Amp discharge material of 30
with same economy + probably discharging much better.


Christmas Eve 1902 T.H.E.
Etc.





7500 lbs —

1 HP Discharge 1 Charge

35000 —
10000
45000 =

8 — 40 / 5 / 8000 —

23 ton 230 — Running 600 starting

35 / 5 / 5250 / 40 / 12 x 1 / 70 / 50 / 8 x 4 / 10 x 10 / 33 1/3 / 44 m

7 / 24 / accelerations / 6 / 5258 / 31.68 / 1900.80

9 mm

25 HP Hours
10 accelerations
35 wind
70 75 746 / 75 / 3730 / 5222 / 2795

200 ft

280 / 300 / 24 / 1500 / 600 / 7200

2.5 ft day 2.5 / 6500 (240 / 500 / 100

5 / 1200 / 240 / 120 / 0

26

180 / 450 (2.5 / 360 / 900

31 / 1200 / 6200

15 / 270 / 120 / 150

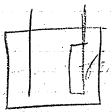
5 / 37200 / 27440 / 3720 / 1860 / 1000 / 160 (4

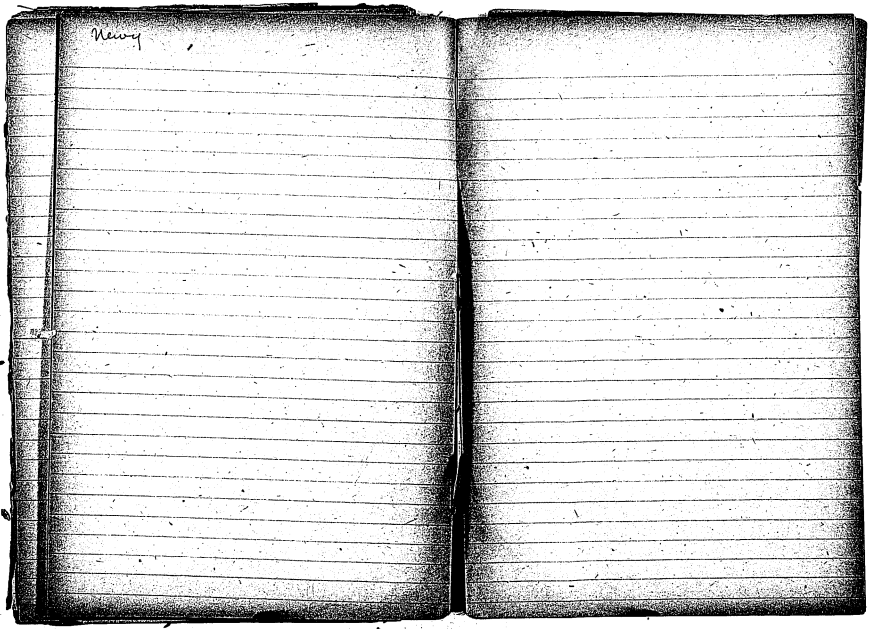
62 / 124 / 124 / 1364 / 1364

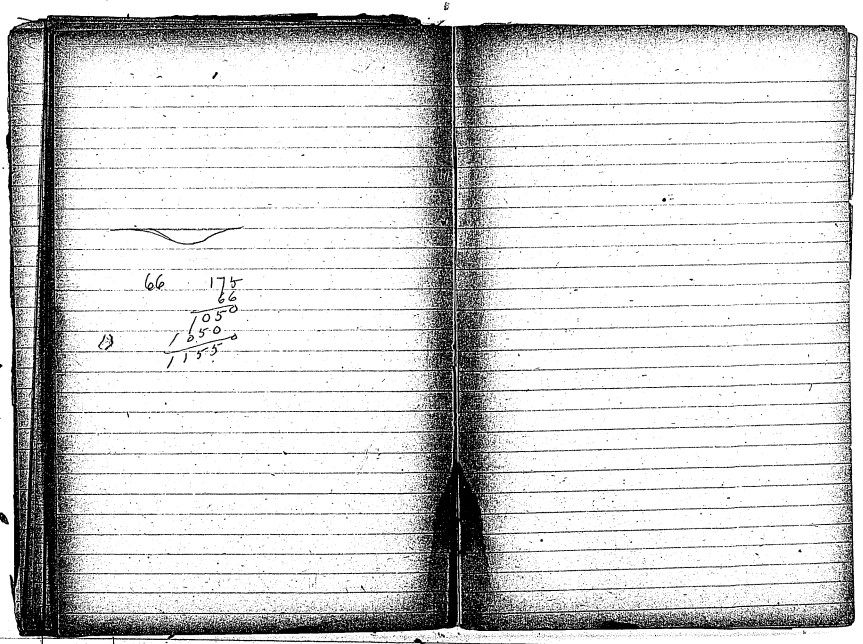
136 / 2000 / 1360 / 640

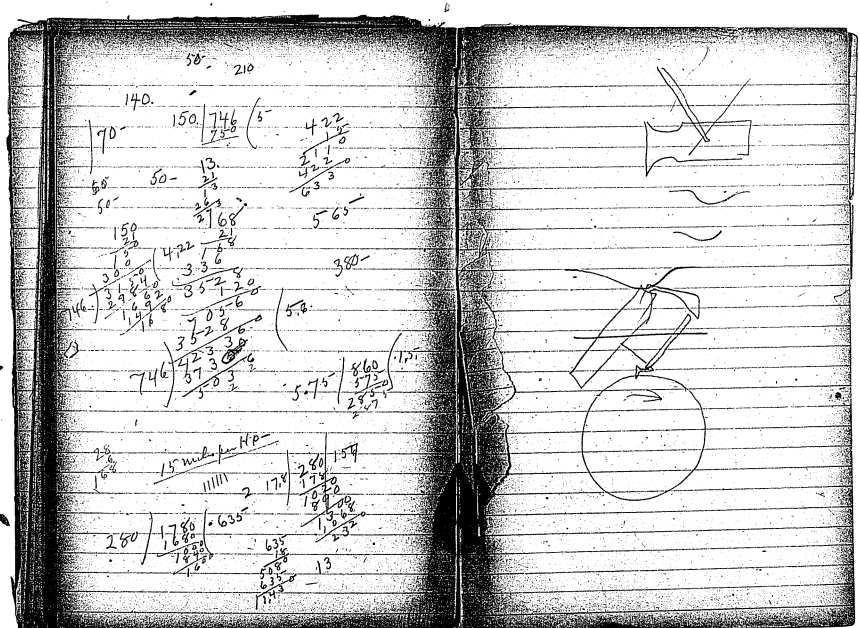
15 25

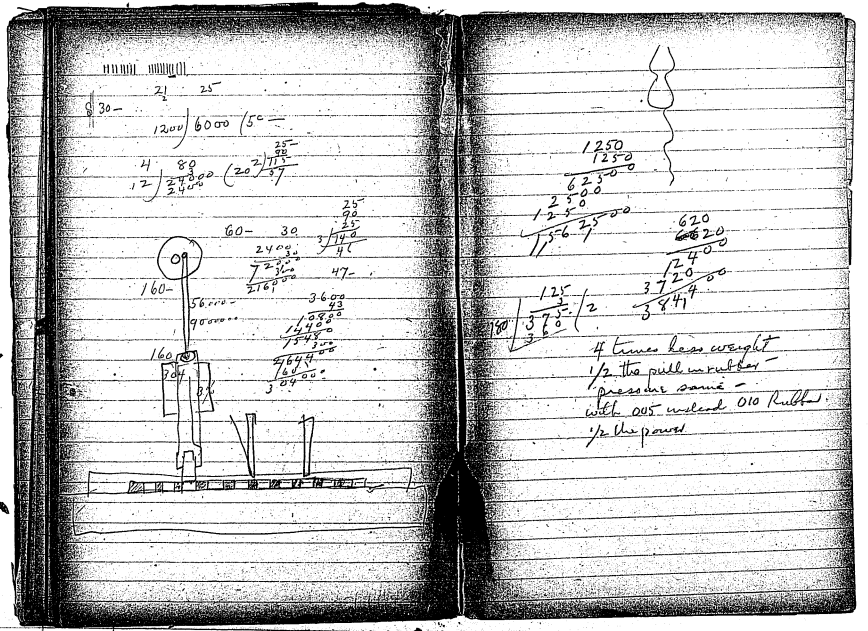
25 / 11160 (446 / 1000 / 1160 / 150

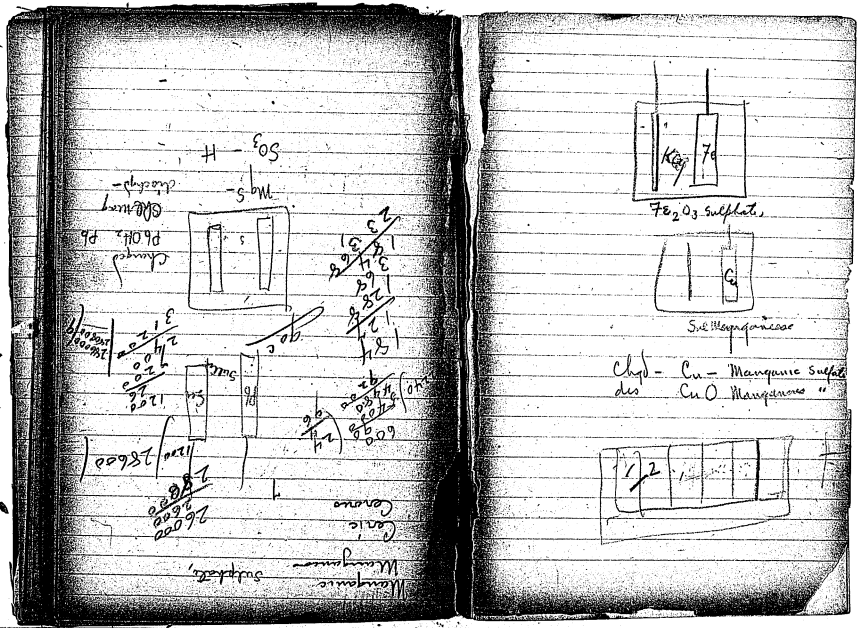
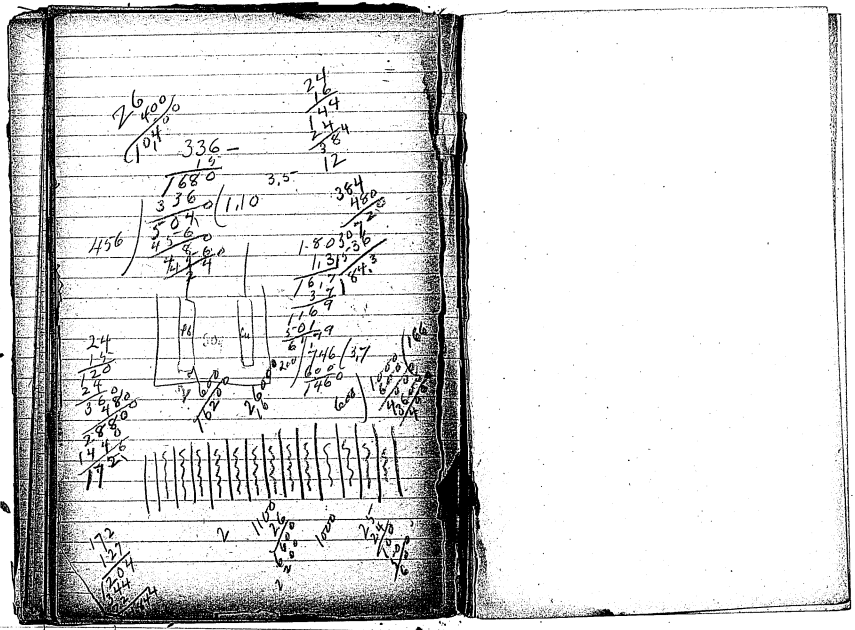
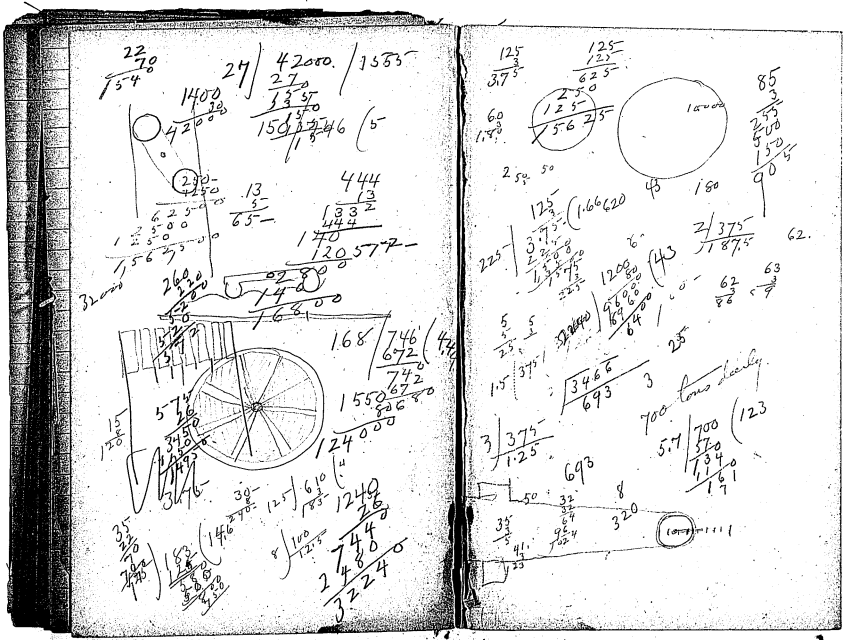



Newy


66
175
66
1050
1650
1155




4 times less weight
1/2 the pull in rubber
pressure same
with .005" instead .010 Rubber
1/2 the power


Fe2O3 sulphate,
Sulf Manganèse
Chyd - Cu - Manganèse Sulfat
des CuO Manganèse "